

## Study of the effects of different biomaterials on osteogenic differentiation of oral-periosteal cells

Gabriele Ceccarelli<sup>1</sup> - Laura Benedetti<sup>1</sup> - Rossella Presta<sup>2</sup> - Maurizio Alloni<sup>3</sup> - Nefele Giarratana<sup>4</sup> - Martina Balli<sup>1</sup> - Ruggero Rodriguez Y Baena<sup>2</sup> - Silvana Rizzo<sup>2</sup> - Maria Gabriella Cusella De Angelis<sup>3</sup>

<sup>1</sup> Department of Public Health, Experimental Medicine and Forensic and CHT, University of Pavia, Pavia, Italia - <sup>2</sup> School of Dentistry, Department Clinico-Surgical, Diagnostic and Pediatric Sciences, University of Pavia, Pavia, Italia - <sup>3</sup> Department of Public Health, Experimental Medicine and Forensic, University of Pavia, Pavia, Italia - <sup>4</sup> Department of Applied and Basic Medical Sciences, University of Chieti-Pescara, Chieti, Italia

Bone regeneration is currently one of the most important challenges for regenerative medicine and it is considered an ideal clinical strategy in the maxillo-facial area [1]. Bone resorption of alveolar crest occurring after tooth extraction leads to several risks for future treatments, including dental implants. For this reason, alveolar ridge preservation (ARP) has become a key component of contemporary clinical dentistry. Several clinical techniques and bone substitute materials can be used to fill the socket after tooth extraction. For all of them, the principle aim is to keep the shape and the size of the bone socket of the extracted tooth allowing inserting the dental implants [2]. The goal of our study was to compare different biocompatible scaffolds based on PLGA (Fisiograft®), Bioglass (Activioss®) and collagen (Sombrero®) in an in vitro model of tissue engineering for dental applications. The cells used in our study derived from Periosteum obtained from four different patients that underwent socket preservation selected by the School of Dentistry of the University of Pavia, previous informed consent. We created bio-complexes constituted by mesenchymal-periosteal cells seeded on different types of biomaterials and we performed adhesion, morphological, proliferative and bone differentiation analyses at different time points (7, 14 and 28 days of culture) in proliferative and osteogenic conditions. Bone differentiation was evaluated by qRT-PCR on genes involved in osteoblast development, like BMP-2, Osteocalcin and Periostin. Our results demonstrated that Sombrero® enhanced adhesion and proliferation of periosteal cells, as highlighted by Haematoxylin-Eosin staining and XTT test (3 and 7 days). Long-term studies (14 and 28 days) demonstrated that periosteal differentiation is about the same among the different materials tested. From these preliminary studies we can conclude that it could be advantageous the clinical use of both collagenic and PLGA scaffolds in order to ameliorate initial colonization and subsequent mechanical support in maxillo-bone regeneration.

This work was supported by grant from NATO 2016 ("RAWINTS" (G-984961): RAPid Skin Wound healing by INtegrated Tissue engineering and Sensing).

### References

- [1] Bhumiratana et al. (2016) Tissue-engineered autologous grafts for facial bone reconstruction. *Sci Transl Med* 8 (343):343ra8 doi:10.1126/scitranslmed.aad5904.
- [2] Tatullo et al. (2015) The regenerative medicine in oral and maxillofacial surgery: the most important innovations in the clinical application of mesenchymal stem cells. *Int J Med Sci* 12(1):72-7. doi: 10.7150/ijms.10706.

### Keywords

Bone regeneration; socket preservation; PLGA scaffold; collagen scaffold; mechanical support.